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2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons

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Activities of the International Atomic Energy Agency relevant to article III of the Treaty on the Non-Proliferation of Nuclear Weapons

Background paper prepared by the Secretariat of the International Atomic Energy Agency

Executive Summary

- According to its Statute, the objectives of the International Atomic Energy Agency (IAEA) are to "seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world" and to "ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose".
- The 2010 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons reaffirmed that IAEA is the competent authority responsible for verifying and assuring States parties' compliance with their safeguards agreements. IAEA has continued to function as such, implementing safeguards and drawing safeguards conclusions.
- In order for IAEA to continue to fulfil its mandate under article III of the Non-Proliferation Treaty, the IAEA safeguards have been strengthened since 2010 and their implementation has continued to evolve. Additional States have concluded comprehensive safeguards agreements, brought into force additional protocols and modified or rescinded small quantities protocols to their comprehensive safeguards agreements. The implementation of IAEA safeguards has evolved through, for example, the further development of safeguards concepts and approaches, strengthened information analysis and State evaluation, and the use of advanced technology and techniques. The capabilities of IAEA to analyse nuclear material and environmental samples have been enhanced and information technology is being modernized. New tools and equipment have been deployed. Processes and procedures have been improved and new initiatives have been taken to improve quality management and measure performance. IAEA has also been preparing for future challenges.

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- The steps taken have strengthened the effectiveness and improved the efficiency of IAEA safeguards, at a time when the Agency's workload has grown steadily while resources have not increased commensurately. Over the past years, the general trend has been of increasing safeguards responsibilities: in the last five years, the number of nuclear facilities under safeguards has risen by 12 per cent and the quantity of nuclear material under safeguards has increased by 14 per cent. Today, IAEA implements safeguards in some 1,300 facilities and applies safeguards to nuclear material equivalent to approximately 190,000 significant quantities. In addition, IAEA is continuing its effort to resolve outstanding safeguards implementation issues in three States and has taken on additional monitoring and verification activities in one of these States.

- Given the interest in nuclear energy and other challenges, IAEA, now and in the future, is likely to have to deliver soundly based safeguards conclusions in a resource-constrained environment. Therefore, it will continue to seek ways to improve its productivity by optimizing processes and making better use of modern technology. And given that safeguards implementation is a cooperative effort, it will seek to further enhance cooperation with State and regional authorities in the implementation of safeguards. Continued success requires States' political, technical and financial support.

Introduction

1. IAEA and its safeguards were established nearly 60 years ago to help ensure that nuclear energy would serve peace and development. The purpose of IAEA safeguards is to provide credible assurances to the international community that nuclear material and other specified items placed under IAEA safeguards are not diverted from peaceful uses to nuclear weapons or other nuclear explosive devices.

2. IAEA safeguards are grounded in the provisions of the IAEA Statute. Article III.A.5 of the Statute authorizes IAEA to establish and administer safeguards designed to ensure that nuclear material, services, equipment, facilities and information made available by IAEA or at its request or under its supervision or control are not used in such a way as to further any military purpose. Article III.A.5 also authorizes IAEA to apply safeguards to any bilateral or multilateral arrangement, at the request of the parties, and to any of the nuclear activities of a State, at that State's request. Pursuant to this authority, IAEA concludes agreements with States, and with regional inspectorates, for the application of safeguards. These agreements are of three types: (a) comprehensive safeguards agreements with non-nuclear-weapon States party to the Non-Proliferation Treaty; (b) voluntary offer safeguards agreements with the nuclear-weapon States party to the Treaty; and (c) item-specific safeguards agreements with non-Treaty States.[1]

3. Article III of the Non-Proliferation Treaty requires all non-nuclear-weapon States party to the Treaty to accept safeguards, as set forth in an agreement to be

[1] The IAEA implements item-specific safeguards agreements, which are based on INFCIRC/66/Rev.2, in States that are not party to the Non-Proliferation Treaty. Under these agreements, the IAEA applies safeguards to ensure that nuclear material, non-nuclear material, facilities and other items subject to such safeguards agreements are not used for the manufacture of any nuclear weapon or to further any military purpose, and that such items are used exclusively for peaceful purposes and not for the manufacture of any nuclear explosive device.

negotiated and concluded with IAEA in accordance with the IAEA Statute and the IAEA safeguards system. Comprehensive safeguards agreements, which follow the structure and content set out in IAEA document INFCIRC/153 (Corrected),[2] are also required under other bilateral or multilateral arrangements.[3]

4. Under its comprehensive safeguards agreement, each State undertakes to accept IAEA safeguards on all source or special fissionable material in all peaceful nuclear activities within the territory of the State, under its jurisdiction, or carried out under its control anywhere. For its part, IAEA has a corresponding right and obligation to ensure that safeguards are applied on all such material for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices. IAEA verifies that State declarations of nuclear material subject to safeguards are not only "correct" (i.e., that they accurately describe the type(s) and quantity(ies) of a State's declared nuclear material holdings), but also are "complete" (i.e., that they include everything that is required to be declared).

5. Each of the five nuclear-weapon States has concluded a voluntary offer safeguards agreement with IAEA. Under such an agreement, IAEA applies safeguards to nuclear material in those facilities or parts thereof which have been selected by IAEA from the State's list of eligible facilities in order to verify that such material is not withdrawn from safeguards except as provided for in the agreement.[4]

6. A State with a safeguards agreement(s) may also conclude a protocol additional to its safeguards agreement. In 1997, the IAEA Board of Governors approved the Model Additional Protocol to "strengthen the effectiveness and improve the efficiency of the safeguards system as a contribution to global nuclear non-proliferation objectives".[5] The additional information and broader access for IAEA inspectors provided for in the additional protocol are designed to "fill the gaps" in information and access required under comprehensive safeguards agreements. The additional protocol is essential for IAEA to obtain a more complete picture of the existing and planned nuclear programmes and material holdings of States with comprehensive safeguards agreements. Thus, the entry into force and implementation of an additional protocol in a State with a comprehensive safeguards agreement is of vital importance for IAEA to be able to provide assurances about the

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[2] The Structure and Content of Agreements between the Agency and States required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.

[3] These arrangements include: the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco); the South Pacific Nuclear Free Zone Treaty (Rarotonga Treaty); the Argentine-Brazilian Declaration on Common Nuclear Policy (28 November 1990); the Treaty on the Southeast Asia Nuclear Weapon-Free Zone (Treaty of Bangkok); the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba); and the Treaty on a Nuclear-Weapon-Free Zone in Central Asia (Treaty of Semipalatinsk).

[4] In selecting facilities under voluntary offer safeguards agreements for the application of safeguards, the IAEA takes into consideration factors such as: (a) whether the selection of a facility would satisfy legal obligations arising from other agreements concluded by the State; (b) whether useful experience may be gained in implementing new safeguards approaches or in using advanced equipment and technology; and (c) whether the cost efficiency of IAEA safeguards may be enhanced by applying safeguards, in the exporting State, to nuclear material being shipped to States with comprehensive safeguards agreements in force.

[5] Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards (INFCIRC/540 (Corrected)).

exclusively peaceful nature of that State's nuclear programme. The measures provided for under additional protocols significantly increase the ability of IAEA to verify the peaceful use of all nuclear material in States with comprehensive safeguards agreements.

7. As a means of minimizing the burden of safeguards implementation for those States with minimal or no nuclear activities, a small quantities protocol was introduced by IAEA in the early 1970s. Its practical effect was to hold in abeyance the implementation of most of the provisions in Part II[6] of a State's comprehensive safeguards agreement as long as certain eligibility criteria were met. In 2005, the Board of Governors approved a revision to the standard text of the small quantities protocol, reducing the provisions held in abeyance, and modified the eligibility criteria for such a protocol, making it unavailable to a State with an existing or planned facility. Under a small quantities protocol based on the revised text, the State is required to submit to IAEA an initial report on all nuclear material and inform IAEA as soon as a decision to construct or authorize the construction of a nuclear facility has been taken, and IAEA may carry out inspections in the State. The Board called on all States with small quantities protocols to amend or rescind their protocols, as appropriate, as soon as possible.

8. Every year, IAEA draws a safeguards conclusion for each State with a safeguards agreement in force. In order to draw an independent and soundly based safeguards conclusion, IAEA needs to have conducted a sufficient level of safeguards activities and a comprehensive evaluation of all safeguards-relevant information[7] available to it about a State, including the results of its verification activities. A safeguards conclusion is drawn when all the necessary safeguards activities have been completed and no indication has been found by the Secretariat that, in its judgement, would constitute a safeguards concern.

9. For IAEA to be able to draw a safeguards conclusion that all nuclear material in a State with a comprehensive safeguards agreement is in peaceful activities, the State needs to have both a comprehensive safeguards agreement and an additional protocol in force, and IAEA must have been able to conduct all necessary verification and evaluation activities. For States with comprehensive safeguards agreements but no additional protocols in force, IAEA only draws a safeguards conclusion with respect to declared nuclear material.

Activities of IAEA since the 2010 Review Conference

10. This section reports on IAEA activities relevant to the implementation of article III of the Non-Proliferation Treaty, with a focus on the period since the 2010 Review Conference. The Final Document of the 2010 Review Conference contained a number of conclusions and recommendations for follow-on actions in that regard.

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[6] Part II specifies the procedures to be applied for the implementation of the safeguards provisions of Part I.

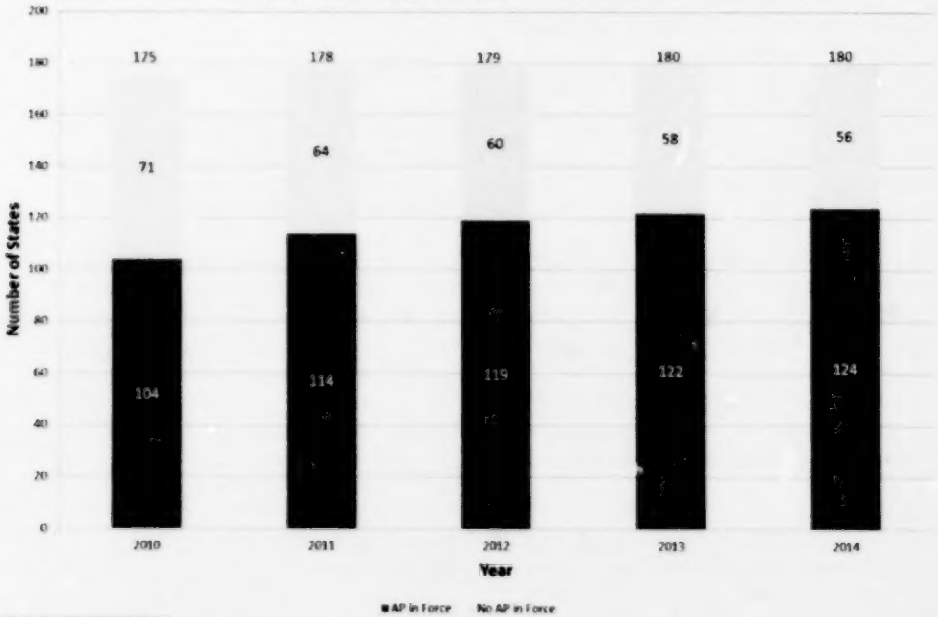
[7] The three main types of such information are: (a) information submitted by States; (b) information obtained through IAEA safeguards activities in the field and at headquarters; and (c) other relevant information (e.g., from open sources and provided by third parties).

1. Promoting the conclusion of comprehensive safeguards agreements and additional protocols

11. Although it is a legal obligation under article III of the Treaty for each non-nuclear-weapon State party to bring into force a comprehensive safeguards agreement, as of the end of 2014, 12 of those States had yet to conclude with IAEA and bring into force such an agreement. In response to calls for wider adherence to additional protocols in the Final Document of the 2010 Review Conference (Conclusions and recommendations for follow-on actions), resolutions of the IAEA General Conference and resolutions of the General Assembly, as of the end of 2014, 124 States (including 123 States party to the Treaty) had brought additional protocols into force; 60 of some 100 States had accepted the revised small quantities protocol text (which was in force for 53 of these States) and 4 States had rescinded their small quantities protocols.

12. IAEA has continued to implement the Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols,[8] which has been updated annually since 2001. These outreach efforts have led to significant progress. At the time of the 2010 Review Conference, 18 non-nuclear-weapon States parties remained without comprehensive safeguards agreements in force and 101 States (including more than two thirds of the States with comprehensive safeguards agreements in force) had additional protocols in force. Since then, until the end of 2014, 6 additional States had brought into force comprehensive safeguards agreements; 23 States (including 22 States party to the Treaty) had brought into force additional protocols; 17 States had accepted the revised small quantities protocol text and 2 States had rescinded their small quantities protocols.

Status of additional protocols for States with safeguards agreements in force, 2010-2014 (the Democratic People's Republic of Korea is not included)



[8] www.iaea.org/safeguards/documents/sg_actionplan.pdf.

2. Safeguards implementation

13. As at the end of 2014, safeguards were applied for 180 States[9,10] with safeguards agreements in force with IAEA. The IAEA secretariat's findings and safeguards conclusions are reported annually to the IAEA Board of Governors through the Safeguards Implementation Report. The report also provides a description and analysis of IAEA safeguards activities and summarizes the challenges encountered. The release of the Safeguards Statement, Background to the Safeguards Statement and Summary of the Safeguards Implementation Report are subject to the approval of the Board of Governors.

14. In addition to the previously selected facilities in China, France, the United Kingdom of Great Britain and Northern Ireland and the United States of America, in 2010, for the first time, IAEA selected for the application of safeguards the storage facility at the International Uranium Enrichment Centre in Angarsk, Russian Federation, following an agreement between Russia and IAEA in March 2010 on the establishment of a guaranteed physical reserve of low enriched uranium at that facility. Therefore, IAEA has been applying safeguards in all five voluntary offer safeguards agreement States since 2010. While the number of facilities selected by IAEA from the States' lists of eligible facilities has remained relatively constant in the past five years, the total amount of nuclear material (by significant quantity)[11] under safeguards in these facilities has grown during this period by some 10 per cent.

3. Safeguards implementation issues

15. There have been a number of important safeguards implementation issues since the 2010 Review Conference. IAEA has been working to resolve outstanding safeguards implementation issues in three States.

Democratic People's Republic of Korea

16. Since 1994, IAEA has not been able to conduct all necessary safeguards activities provided for in the Democratic People's Republic of Korea Non-Proliferation Treaty Safeguards Agreement. Since April 2009, IAEA has not been able to implement any safeguards measures in the country. Therefore, IAEA could not draw any safeguards conclusion regarding the Democratic People's Republic of Korea during the time since the 2010 Review Conference.

17. Since April 2009, IAEA also has not implemented any measures under the ad hoc monitoring and verification arrangement agreed between IAEA and the Democratic People's Republic of Korea and foreseen in the Initial Actions agreed at the Six-Party Talks. Since 2010, the Democratic People's Republic of Korea has made a number of statements indicating that it is continuing its nuclear activities, including statements concerning: the conduct of a third nuclear test and its "right" to conduct further nuclear tests; uranium enrichment activities; construction of a light water reactor; and its intention to readjust and restart its nuclear facilities at Yongbyon.

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[9] These States do not include the Democratic People's Republic of Korea, where IAEA did not implement safeguards and, therefore, could not draw any conclusion.

[10] And Taiwan Province of China.

[11] "Significant quantity" is the approximate amount of nuclear material for which the possibility of manufacturing a nuclear explosive device cannot be excluded.

18. Although not implementing any verification activities in the field, IAEA has continued to monitor the nuclear activities of the Democratic People's Republic of Korea by using open source information (including satellite imagery and trade information). Using satellite imagery, IAEA has continued to observe signatures which are consistent with operation of the 5-megawatt electric (MWe) reactor at Yongbyon and renovation or expansion of other buildings within the site. However, without access to the relevant site, IAEA cannot confirm the operational status of the reactor or the purpose of the other observed activities. IAEA has continued to further consolidate its knowledge of the nuclear programme of the Democratic People's Republic of Korea with the objective of maintaining operational readiness to resume safeguards implementation in the country.

Islamic Republic of Iran

19. Since 2010, the IAEA Board of Governors has adopted two resolutions on the implementation of safeguards in the Islamic Republic of Iran.[12] In June 2010, the Security Council also adopted an additional resolution[13] related to Iran's nuclear programme in which the Council, inter alia, affirmed the Islamic Republic of Iran shall cooperate fully with IAEA on all outstanding issues, particularly those which give rise to concerns about the possible military dimensions of the Iranian nuclear programme, including by providing access without delay to all sites, equipment, persons and documents requested by IAEA. The Council also decided that Iran shall, without delay, comply fully and without qualification with its Safeguards Agreement, including through the application of modified Code 3.1 of the Subsidiary Arrangements General Part to its Safeguards Agreement, and called upon the Islamic Republic of Iran to act strictly in accordance with the provisions of its additional protocol and to ratify it promptly. In November 2011, the Director General of IAEA set out in more detail the basis for the Agency's concerns about possible military dimensions to Iran's nuclear programme. As of the end of 2014, contrary to the relevant binding resolutions of the Board of Governors and the Security Council, Iran had not implemented the provisions of its additional protocol, implemented the modified Code 3.1 of the Subsidiary Arrangements General Part, suspended all enrichment related activities or suspended all heavy water-related activities.

20. In November 2013, IAEA and the Islamic Republic of Iran signed a "Joint Statement on a Framework for Cooperation", in which they agreed to strengthen their cooperation and dialogue aimed at ensuring the exclusively peaceful nature of the country's nuclear programme through the resolution of all outstanding issues and to proceed with IAEA verification activities in a step-by-step manner. Out of a total of 18 practical measures agreed between November 2013 and May 2014, as of the end of 2014, the Islamic Republic of Iran had implemented 16 of them; 2 of the practical measures related to possible military dimensions of the country's nuclear programme remained to be implemented. IAEA also invited the Islamic Republic of Iran to propose new practical measures to address concerns over possible military dimensions, to be implemented in the next step of the Framework for Cooperation, but the country had not proposed any such measures and no new practical measures had been agreed by the end of 2014.

[12] GOV/2011/69 (18 November 2011) and GOV/2012/50 (13 September 2012).

[13] Resolution 1929 (2010).

21. On 24 November 2013, China, France, Germany, the Russian Federation, the United Kingdom and the United States agreed on a Joint Plan of Action with the Islamic Republic of Iran in Geneva. The preamble to the Joint Plan of Action states that "the goal for these negotiations is to reach a mutually-agreed long-term comprehensive solution that would ensure the country's nuclear programme will be exclusively peaceful". Since 20 January 2014, IAEA has undertaken monitoring and verification activities in relation to the nuclear-related measures set out in the Joint Plan of Action. The initial duration of the Joint Plan of Action was six months. On 24 July 2014, it was extended until 24 November 2014, when it was further extended until 30 June 2015. The Agency's work in relation to the Joint Plan of Action has required approximately doubling its verification activities compared with those it had been carrying out pursuant to the country's Safeguards Agreement and the relevant resolutions of the Board of Governors and the Security Council.

22. As outlined in the relevant reports of the Director General to the Board of Governors, while IAEA has continued to verify the non-diversion of declared nuclear material at nuclear facilities and location outside facilities declared by the Islamic Republic of Iran under its Safeguards Agreement, IAEA has not been in a position to provide credible assurance about the absence of undeclared nuclear material and activities in Iran and, therefore, to conclude that all nuclear material in the country is in peaceful activities.

Syrian Arab Republic

23. In his report to the Board of Governors of May 2011, the Director General provided the Agency's assessment that, on the basis of all the information available to IAEA and its technical evaluation of that information, it was very likely that the building destroyed at the Dair Alzour site in the Syrian Arab Republic was a nuclear reactor which should have been declared to IAEA. In June 2011, the Board of Governors, by a vote, adopted a resolution in which, inter alia, it found that the country's undeclared construction of a nuclear reactor at Dair Alzour and failure to provide design information for the facility constituted non-compliance by the Syrian Arab Republic with its obligations under its Non-Proliferation Treaty Safeguards Agreement with IAEA in the context of article XII.C of the IAEA Statute. The Board of Governors called upon the Syrian Arab Republic to remedy its non-compliance urgently and provide IAEA with updated reporting under its Safeguards Agreement and access to all information, sites, material and persons necessary for IAEA to verify such reporting and resolve all outstanding questions so that the Agency could provide the necessary assurances as to the exclusively peaceful nature of the country's nuclear programme. The Board also decided to report, as provided for in article XII.C of the Statute, through the Director General, the country's non-compliance with its Safeguards Agreement to all members of IAEA and to the Security Council and the General Assembly. The Board requested the Director General to continue his efforts to implement fully the IAEA Safeguards Agreement with the Syrian Arab Republic and to report any significant developments to the Board and to the Council, as appropriate, and decided to remain seized of the matter. In September 2014, the Director General informed the Board of Governors that no new information had come to the knowledge of IAEA that would have an impact on the Agency's 2011 assessment about the building destroyed at the Dair Alzour site, and renewed his call upon the Syrian Arab Republic to cooperate

fully with IAEA in connection with unresolved issues related to the Dair Alzour site and other locations. The Syrian Arab Republic has yet to respond to these calls.

24. In September 2013 the Director General reported to the Board that, after considering the assessment by the United Nations Department of Safety and Security of the prevailing security conditions in the Syrian Arab Republic and the small amount of nuclear material as declared by the country at the Miniature Neutron Source Reactor, a decision was made to postpone a physical inventory verification at the reactor in Damascus until the security conditions had improved sufficiently.[14] As at the end of 2014, the assessment had not changed.

4. Development of safeguards concepts, approaches, and technology

State-level concept

25. In order to continue to draw soundly based safeguards conclusions and to increase confidence that States are abiding by their safeguards obligations, IAEA has continued to develop and apply a concept for safeguards implementation, within the existing legal framework, termed the State-level concept. The State-level concept refers to the general notion of implementing safeguards in a manner that considers a State's nuclear and nuclear-related activities and capabilities as a whole, within the scope of the State's safeguards agreement. The State-level concept is applicable to all States with safeguards agreements in force. Although "State as a whole" considerations in the implementation of safeguards are long-standing, dating back to the early 1990s, the term "State-level concept" has been used by the Secretariat only since 2004. Customized (i.e., tailor-made) State-level safeguards approaches for individual States have been implemented to date for the 53 States under integrated safeguards[15] (i.e., States with comprehensive safeguards agreements and additional protocols for which the broader conclusion[16] has been drawn and where the necessary arrangements have been completed to implement the State-level safeguards approaches).

26. In 2013, the Director General submitted a report on the State-level concept to the Board of Governors. In 2014, following a series of technical meetings on the concept between the Secretariat and member States, a document supplementing the 2013 report was submitted to the Board. The 2014 supplementary document provided more details on information presented in the 2013 report and also described how the State-level concept is applicable to States with item-specific safeguards agreements and States with voluntary offer safeguards agreements. The 2014 supplementary document stated, inter alia, that the IAEA secretariat would continue to implement the existing 53 State-level safeguards approaches for States under integrated safeguards and was currently in the process of updating them; planned for the progressive development of State-level safeguards approaches for other States in the future; and

[14] In 2014 the Syrian Arab Republic indicated readiness to receive IAEA inspectors and to provide support, for the purpose of performing a physical inventory verification at the Miniature Neutron Source Reactor.

[15] Integrated safeguards refer to an optimized combination of all safeguards measures available to IAEA under comprehensive safeguards agreements and additional protocols. Integrated safeguards may be implemented for States for which IAEA has drawn the broader conclusion. Integrated safeguards are aimed at optimizing the effectiveness and efficiency of safeguards implementation for those States.

[16] A safeguards conclusion, for a State with a comprehensive safeguards agreement and an additional protocol in force, that all nuclear material in a State remains in peaceful activities.

that in developing and implementing a State-level safeguards approach for a State, the Secretariat would consult with the State and/or regional authorities, particularly on the implementation of in-field safeguards measures. The 2014 supplementary document also noted that the implementation of safeguards in the context of the State-level concept would not entail the introduction of any additional rights or obligations on the part of either States or IAEA nor any modification in the interpretation of existing rights and obligations, and that the IAEA secretariat would use uniform processes and better defined procedures to develop State-level safeguards approaches and guide safeguards implementation in a consistent and non-discriminatory manner for all States with the same type of safeguards agreement.

27. The Board of Governors took note of the 2013 report and the clarifications and additional information provided in the 2014 supplementary document and the Director General's intention to continue to keep the Board informed on the matter. In 2014 the IAEA General Conference, following an intensive consultation process between the Secretariat and member States, adopted resolution GC(58)/RES/14 in which, inter alia, it welcomed the clarifications and additional information provided in the 2014 supplementary document. It also welcomed the important assurances contained in the 2014 supplementary document and its corrigenda, and in the statements by the Director General and the Secretariat as noted by the Board of Governors at its September 2014 session.

Safeguards approaches for facilities

28. IAEA seeks to continually improve the effectiveness and efficiency of safeguards implementation at facilities by evaluating safeguards approaches and identifying potential improvements. IAEA implements these approaches in cooperation with States and/or regional authorities. Enhancements to safeguards implementation at existing facilities may be achieved by, for example, installing new equipment such as remote monitoring systems, dual containment and surveillance or unattended measurement systems. For facilities that are under construction, IAEA works closely with the relevant State and/or regional authority, and the facility operator, to incorporate safeguards features into the design of new facilities. For example, for the past several years, IAEA has been involved in the development of the safeguards approach for facilities under construction at the site of the Chernobyl nuclear power plant in Ukraine and the Mixed Oxide Fuel Fabrication Plant at the Rokkasho site in Japan. IAEA, the European Commission, Finland and Sweden have cooperated closely to prepare for safeguards implementation at encapsulation plants and geological repositories being planned in those States.

Information analysis

29. The analysis of safeguards-relevant information is an essential part of evaluating a State's nuclear activities and drawing safeguards conclusions. In drawing its safeguards conclusions, IAEA processes, evaluates and conducts consistency analyses of State declarations, the results of its verification activities and other safeguards-relevant information available to the Agency. Since 2010, IAEA has continued to enhance and diversify its capabilities to acquire and process data, analyse and evaluate information and generate knowledge and to securely distribute information internally, as an essential contribution to the State evaluation process and the drawing of safeguards conclusions.

30. The volume of safeguards-relevant information has continued to rise in the past five years. On an annual basis, IAEA receives some 700,000 declarations and reports entries provided by States, prepares over 200 nuclear material balance evaluation reports and integrates and interprets the results of between 400 and 500 environmental samples. Some 400-500 satellite images are acquired and analysed each year for safeguards purposes.[17] In 2011, IAEA formally accepted a geospatial exploitation system to support the analysis of imagery and the secure dissemination of geospatial data within the Department of Safeguards. The number of member States voluntarily supporting IAEA with information on safeguards-relevant trade and procurement, outside of reporting obligations pursuant to relevant safeguards agreements, has increased three-fold since 2010. Ongoing reviews of technical cooperation projects and procurements also provided relevant safeguards input.

31. IAEA has also continued to investigate new tools and methodologies to streamline and prioritize the associated workflows and processes. IAEA has worked to strengthen links between State evaluation- and verification-related activities in the field. State evaluation has increasingly been carried out collaboratively, by multidisciplinary teams of IAEA staff. To continuously improve the quality of the information on which it must rely, the IAEA monitored laboratory and measurement systems performance, organized international technical meetings and provided to States training and workshops on nuclear material accounting, including measurement and material balance evaluation concepts.

Safeguards sample analysis

32. The IAEA Safeguards Analytical Laboratories in Seibersdorf, Austria, is responsible for processing, screening, distributing, analysing and archiving environmental and nuclear material samples. In the past five years, IAEA has undertaken a major project called "Enhancing Capabilities of the Safeguards Analytical Services". In September 2011, IAEA formally opened the new extension to the IAEA Clean Laboratory at the Safeguards Analytical Laboratories. It contains a state-of-the-art Large Geometry Secondary Ion Mass Spectrometer that greatly improves the Agency's ability to independently analyse environmental samples. In September 2013, IAEA inaugurated the new Nuclear Material Laboratory at the Safeguards Analytical Laboratories, giving the Department of Safeguards an enhanced set of independent verification capabilities in areas such as the analysis of uranium, plutonium, spent fuel and high-activity liquid waste samples, as well as in archiving samples safely and securely. This comprehensive modernization of the safeguards laboratories is one of the most important projects which IAEA has undertaken to support its safeguards activities.

33. The IAEA Network of Analytical Laboratories, which augments the analytical capabilities of the Safeguards Analytical Laboratories, currently comprises the Laboratories and 20 other qualified laboratories of IAEA member States and the European Commission. IAEA is working to qualify additional laboratories in other member States for environmental analysis as well as for nuclear material sample analysis.

[17] In addition, in 2011, in response to the earthquake and tsunami in Japan, IAEA acquired and analysed imagery of the Fukushima Daiichi nuclear power plant on a daily basis and provided extensive analysis of radionuclide inventories. This information played a critical role in helping to inform member States, as well as the public, about the situation.

Safeguards information technology

34. In the area of safeguards infrastructure development, IAEA has been working to modernize its information technology for safeguards to address shortcomings: safeguards information technology has over the years become outdated, is increasingly difficult to maintain, is struggling to cope with the mounting volume and diverse formats of data and information, does not support all safeguards activities and is becoming more vulnerable to cyberattacks. Since 2010, IAEA activities have focused in particular on modernization of software applications that support the Agency's daily safeguards activities and on transferring them to a modern information technology platform. The applications help, for example, to manage nuclear material accounting data and record data and generate reports from inspectors' in-field activities, store results of nuclear material samples and assist in the internal evaluation of the quality and effectiveness of the performed verification activities. IAEA has also worked to strengthen information technology security. The final step in the modernization will be carried out under the "Modernization of Safeguards Information Technology" (MOSAIC) project, which was established in 2013. Completing the modernization is essential to address current deficiencies and improve the performance of safeguards activities.

Safeguards equipment

35. Safeguards implementation relies heavily on technology, which needs to be reliable, fit for purpose and secure. IAEA has increased its efforts since 2010 to improve system reliability and modularity, optimize the use of commercial off-the-shelf components and enhance the usability of portable verification instruments and systems. The use of remote monitoring systems has continued to increase since 2010, when 258 safeguards systems with remote monitoring were in use. By mid-2014, this figure had grown to 283. Likewise, the number of installed surveillance systems increased from 1,173 to 1,362 between 2010 and 2014. A major improvement over this time period has been the replacement of outdated surveillance systems with the "Next Generation Surveillance System"; to date, more than 400 such systems are installed and operating across the globe. IAEA has also developed, tested, authorized and deployed new instruments since 2010, including, for example, new laser surface mapping verification systems, seal readers, small portable radiation detection and identification units and portable Raman spectrometers.

5. Cooperation with State and regional authorities

36. The practical day-to-day implementation of safeguards for a State works best when it is conducted as a cooperative effort between IAEA and the State, sharing a common understanding and seeking to achieve a successful outcome. IAEA places great value on effective cooperation with State and regional authorities responsible for safeguards implementation, and works to enhance understanding and capacity by providing advisory services, training and assistance and publishing guidance documents addressing all aspects of safeguards implementation. States also make substantial contributions to enhancing the effectiveness and efficiency of IAEA safeguards by, for example: participating in field trials of new safeguards instruments or measures; providing information, in addition to that required under the safeguards agreement or additional protocol, that facilitates safeguards implementation; making facilities available for training of IAEA staff; and

providing experts to contribute to development of guidance documents on safeguards implementation and safeguards by design principles.

Advisory services

37. The IAEA State System of Accounting for and Control of Nuclear Material Advisory Service provides States, at their request, with advice and recommendations on the establishment and strengthening of their State System of Accounting for and Control of Nuclear Material. These Advisory Service missions involve a preparatory meeting followed by a mission, and result in a confidential report to the State with detailed recommendations on how any shortcomings identified in the performance of the respective State System could be rectified and/or further cooperation with IAEA could be implemented to enhance the effective and efficient implementation of IAEA safeguards. Between 2010 and 2014, a total of nine Advisory Service missions were conducted.

Training for member States

38. The IAEA Member State Training Programme in the area of safeguards plays a vital role in building up sustainable knowledge and skills among professionals working at State and regional systems of accounting for and control of nuclear material and in enhancing cooperation between the State and IAEA, which is essential for the effective implementation of safeguards. During the past five years, IAEA has continuously improved the design and delivery of State System of Accounting for and Control of Nuclear Material training activities, taking into account relevant technical developments and state-of-the-art teaching methods.

39. The IAEA Member State Training Programme is addressed to professionals in governmental organizations, regulatory bodies, utilities, the medical sector, relevant industries and customs. Training courses are provided regularly at the regional and international levels and, upon request, at the national level. The courses provided have a modular structure covering a large spectrum of topics, such as safeguards agreements and protocols, accountancy and control of nuclear material, IAEA verification activities, nuclear material measurement techniques or safeguards by design. IAEA also provides customized training courses for States with small quantities protocols or for States introducing nuclear power. Between 2010 and 2014, more than 45 courses were held for about 1,100 professionals from more than 60 States.

40. To make the most use of limited resources, coordination is needed among the various stakeholders that offer safeguards-related training to member States that are building capacity in advance of new nuclear energy programmes. Several initiatives were taken by IAEA over the past five years in this area, including exchanges of lecturers, joint development of training material, sharing of schedules and participation in networks such as the Asia-Pacific Safeguards Network. In 2014, IAEA also developed the first eLearning Programme on safeguards that was developed in the framework of the interactive eLearning series explaining the IAEA Milestones Approach'[18] to introducing a nuclear power programme. The objective of the eLearning Programme is to create awareness for the key issues to be considered

[18] IAEA supports States pursuing nuclear power programmes to assess their preparedness, as described in the publication *Milestones in the Development of a National Infrastructure for Nuclear Power*, IAEA Nuclear Energy Series No. NG-G-3.1 (2007).

related to safeguards infrastructure by States embarking on new nuclear power programmes and the growing level of nuclear activities and quantity and quality of nuclear material in the planning, construction and operation phases of the Milestones Approach.

Guidance documents

41. In 2012, IAEA established the Resources and Assistance for States web page (located at www.iaea.org/safeguards), providing States with access to a wide variety of safeguards guidance, forms, templates and other reference documents. IAEA published the *Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols* (IAEA Services Series No. 21) in March 2012. In 2013, the *Safeguards Implementation Guide for States with Small Quantities Protocols* (IAEA Services Series No. 22) was published in English and subsequently translated into French and Spanish. In 2014, IAEA published the first of four "Safeguards Implementation Practices Guides", entitled *Safeguards Implementation Practices Guide on Facilitating IAEA Verification Activities* (IAEA Services Series No. 30). The Guides aim to provide additional explanatory information and share the experiences and practices of States in implementing their safeguards responsibilities.

Outreach

42. To foster increased dialogue and information exchange with representatives from member States on safeguards matters, IAEA has held a series of technical meetings in addition to its regular consultations. During 2014, IAEA held six interactive technical meetings and held other consultations on the State-level concept.

6. Preparing for the future

Strategic planning

43. Since 2010, IAEA has continued to conduct regular and systematic strategic planning to prepare for the future. It has been implementing the IAEA Medium Term Strategies 2006-2011 and 2012-2017. In August 2010, the Department of Safeguards finalized its first ever long-range strategic plan for 2012-2023 for safeguards, which was presented at the 2010 Safeguards Symposium. In 2012, IAEA also developed a corresponding research and development plan for the same period that articulates the capabilities needed to achieve its objectives and identifies and conveys to member States IAEA safeguards research and development needs of the future.[19] To address near-term development objectives and support safeguards implementation activities, IAEA continued to update its biennial development and implementation support programmes.

[19] The plan addresses the Department's research and development needs in areas such as safeguards concepts and approaches; detection of undeclared nuclear material and activities; safeguards equipment and communication; information technology, collection, analysis and security; analytical services; possible new mandates; and training.

Member States Support Programmes

44. IAEA safeguards development and implementation support needs could not be met without the transfer of technology, funds and expertise provided by member States. Member States Support Programmes have continued to make substantial contributions (in cash and in kind) to the IAEA safeguards since 2010. Today, IAEA is supported by 21 Member States Support Programmes participating in over 350 active tasks. IAEA relies on the unique type of assistance that the Programmes can provide, such as national laboratories to develop equipment for safeguards, facilities for training inspectors and laboratories for conducting independent analyses. Member States Support Programmes remain the principal vehicle through which IAEA achieves its safeguards-related research and development objectives.

Safeguards symposiums

45. Since 2010, IAEA has held its eleventh and twelfth symposiums on international safeguards, in Vienna. The objective of the two symposiums was to foster dialogue and information exchange between the Secretariat, member States, the nuclear industry and members of the broader safeguards and nuclear non-proliferation community. The theme of the eleventh symposium was "Preparing for Future Verification Challenges". Participants discussed in key sessions the Agency's strategic priorities in advancing cooperation between IAEA and its member States, strengthening the Agency's technical capabilities (safeguards approaches, technologies and infrastructure), bolstering its State evaluation capabilities (for example, information collection and evaluation), developing its organizational culture and managing the safeguards workforce and knowledge. At the 2014 symposium, entitled "Linking Strategy, Implementation and People", discussions were structured around the long-term research and development plan of the Department of Safeguards. Presenters examined the Agency's priorities in the areas of advancing cooperation between IAEA and States, strengthening the Agency's technical capabilities (safeguards approaches, technologies and infrastructure), bolstering the Agency's State evaluation capabilities and managing the safeguards workforce and knowledge.

Technology foresight

46. Recognizing the fast pace of technology development, and to remain informed of technological developments with potential safeguards applications, IAEA held "Technology Foresight Workshops" in Vienna in 2012 and 2014. Presentations were delivered on a broad range of topics, including active neutron interrogation, X-ray fluorescence, statistical methods and robotics. In addition, technical meetings with external experts were held on specific topics such as image processing and inertial navigation.

Safeguards by design and proliferation resistance

47. For the effective and efficient implementation of safeguards at new facilities, safeguards measures need to be considered from the initial design planning stages. Following the previous Review Conference, the concept of "safeguards by design" has drawn increasing interest. IAEA has been working to support States and the

nuclear industry in this area by providing general and facility-specific safeguards by design guidance.[20]

48. During the past five years, IAEA has also continued to contribute to assessments of proliferation-resistant nuclear energy systems through its International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) and the Generation IV International Forum, participating in meetings and helping to prepare associated reports.

7. Management and resources

49. Over the past years, the general trend has been of increasing safeguards responsibilities: in the past five years, the number of nuclear facilities under safeguards has risen by 12 per cent and the quantity of nuclear material under safeguards has increased by 14 per cent. In 2014, IAEA was implementing safeguards in some 1,300 facilities, an increase of some 100 facilities since 2010. It spent some 12,000 calendar days in the field, carrying out inspections and other verification activities, and applied safeguards to nuclear material equivalent to approximately 190,000 significant quantities, an increase of some 20,000 compared with year 2010.

Financial resources

50. The financial resources allocated to the Department of Safeguards in 2014 included €131 million from the regular budget and €33 million from extrabudgetary contributions. IAEA has been heavily focused on increasing its efforts in pursuing more efficient and effective ways of implementing safeguards.

51. Efficiency measures have been identified and applied in the areas related to verification activities in the field, upgrading/replacement of equipment and technology, changing to low-maintenance engineering solutions, streamlining and optimization of organizational management processes and continuous implementation of a quality management system. For instance, in cooperation with States, unannounced inspections have been introduced in additional States. The required inspection effort in the field has also been reduced by the introduction and installation of new unattended monitoring systems with remote transmission capability in a number of nuclear facilities. Combining verification activities with installation of equipment in the field has in turn resulted in reductions in travel costs and more efficient optimization of human resources. New information technology tools have been introduced which have resulted in improved staff access to information and facilitated reporting on verification activities and State evaluation. Upon finalization of the MOSAIC project, the improved information technology systems and processes will significantly contribute to the effectiveness and efficiency of safeguards implementation. In addition, in the past five years, IAEA has developed a cost methodology for safeguards which aids in the analysis of the costs of carrying out safeguards activities and the identification of efficient options for their implementation. Further efficiencies are anticipated from the implementation

[20] As part of the IAEA Nuclear Energy series, the Agency published "International Safeguards in Nuclear Facility Design and Construction" (NP-T-2.8) in 2013. "International Safeguards in the Design of Nuclear Reactors" (NP-T-2.9) was issued in 2014, the first in a series of facility-specific guidance.

of safeguards in the context of the State-level concept, including the application of integrated safeguards.

Safeguards workforce

52. The human resources necessary for IAEA to implement safeguards include a wide variety of specialists, mainly nuclear engineers and nuclear physicists. Other scientific and technical groups comprise analysts, chemists, mathematicians, training and education specialists and information management and information technology specialists. To maintain a workforce capable of meeting current and future needs, IAEA continually develops the knowledge and skills of its staff involved in safeguards activities through the delivery of an up-to-date training programme. Since 2010, it has held an average of 100 training courses per year to achieve the technical and behavioural competencies of the staff in the Department of Safeguards (inspectors, analysts, staff from technical divisions, etc.) needed to ensure that safeguards activities are carried out in an effective manner. Each year, it has held an "Introductory Course on Agency Safeguards" for a new generation of IAEA inspectors. In addition to technical training, staff members in supervisory positions have been provided with leadership and management training. Support from member States has been essential to the training of IAEA safeguards staff, particularly in hosting courses involving practical exercises requiring nuclear facilities and/or nuclear material, and in supporting the development of new training tools such as virtual reality environments for facility and process familiarization, training manuals and e-learning platforms.

53. Since 2010, IAEA has also organized three 10-month "Safeguards Traineeship Programmes", training a total of 18 young graduates and junior professionals from 17 different developing countries in order to prepare them for employment in their home countries in the peaceful use of atomic energy, as well as to increase the number of qualified candidates from developing countries for possible hire as safeguards inspectors, either by IAEA or by their national nuclear-related organizations.

Quality management and performance measurement

54. The Department of Safeguards strives to continuously improve its performance through the implementation of a rigorous and comprehensive quality management system. The Department's quality management system helps to ensure that all safeguards activities are performed consistently, objectively and effectively. In addition to the quality management system, the Department of Safeguards initiated activities in 2014 to identify, select and determine how to use performance indicators more effectively to assess its activities and their results and to monitor trends.

Information security

55. Information security is of vital importance to the Department of Safeguards, given the sensitivity of the information in its custody. Safeguards information is protected using a layered approach involving physical protection, policy and procedures, technical controls and security awareness.

56. IAEA has made significant advancements in each of these areas over the past five years. For example, all servers and storage and network equipment have been

placed in highly secure and protected data centres; physical security and controls on access to safeguards offices and laboratories have been strengthened; in-house capabilities to detect and combat malware and other cyberthreats have been significantly expanded; laptops now feature full disk encryption; a robust internal secure environment that is disconnected from the Internet has been established in the Department of Safeguards to handle classified information; security awareness among staff has been raised through training and other steps; and in 2014 the procedures for classification and handling of sensitive information were substantially improved.

8. Conclusion

57. The 2010 Review Conference reaffirmed that IAEA is the competent authority responsible for verifying and assuring States parties' compliance with their safeguards agreements. IAEA has continued to function as such, implementing safeguards and drawing safeguards conclusions. Since 2010, safeguards have been strengthened and their implementation has further evolved in order for IAEA to continue to fulfil its mandate under article III of the Non-Proliferation Treaty.

58. During the period between the 2010 Review Conference and the end of 2014, 6 additional States brought into force comprehensive safeguards agreements; 23 States (including 22 States party to the Non-Proliferation Treaty) brought into force additional protocols; 17 States accepted the revised small quantities protocol text and 2 States rescinded their small quantities protocols, thereby enabling IAEA to apply safeguards and draw safeguards conclusions for a higher number of States and strengthening the assurances provided through IAEA safeguards.

59. IAEA has been continuing its effort to resolve outstanding safeguards implementation issues in three States.

60. The implementation of IAEA safeguards has evolved through, for example, the further development and implementation of the State-level concept, improved safeguards approaches for facilities, strengthened information analysis and State evaluation and use of technology (e.g., remote monitoring and information technology). Verification effort has been reduced through, for example, the implementation of short notice random inspections.

61. In the past five years, IAEA has invested in improving vital safeguards infrastructure and technology. Significant enhancements have been made at the Safeguards Analytical Laboratories and safeguards information technology is being modernized. A new project, called MOSAIC, has been initiated to complete the modernization. Outdated surveillance cameras have been replaced with the Next Generation Surveillance System. New information analysis tools and a geospatial exploitation system have been adopted to support information analysis and visualization.

62. Because the implementation of safeguards is a cooperative effort, IAEA has been working to improve cooperation with States and regional authorities. Through missions of the IAEA State System of Accounting for and Control of Nuclear Material Advisory Service, IAEA has provided advice and recommendations on strengthening State Systems of Accounting for and Control of Nuclear Material. International, regional and national training courses have been held for participants from more than 60 States and new eLearning Programmes have been produced.

Several new guidance documents have been issued for States and regional authorities responsible for safeguards implementation along with the provision of other resources. To foster dialogue with States, IAEA has held a series of meetings with member States to discuss safeguards matters. Two major safeguards symposiums were held, in 2010 and 2014, to exchange views between the Secretariat, member States, the nuclear industry and members of the broader safeguards and nuclear non-proliferation community.

63. To prepare for the future, IAEA has been conducting strategic planning and working with Member State Support Programmes to address safeguards-related research and development needs. It has held technology foresight meetings, worked on safeguards by design guidance and contributed to assessments of proliferation-resistant nuclear energy systems through its International Project on Innovative Nuclear Reactors and Fuel Cycles and the Generation IV International Forum.

64. All these efforts have strengthened the effectiveness and improved the efficiency of safeguards, at a time when the Agency's workload has grown steadily but its resources have not increased commensurately. Given the increasing responsibilities, IAEA in the past five years has had to "do more with less". Hence, IAEA has been working to employ more efficient and effective ways of implementing safeguards to increase productivity. Management activities have focused on sustaining and enhancing its workforce, strengthening quality management and performance measurement and improving information security.

65. In the future, given the sustained interest in the use of nuclear energy, IAEA expects more nuclear material and facilities to come under safeguards. International nuclear cooperation is intensifying with an expansion in trade and services in nuclear and related equipment, items and materials. IAEA will also need to continue to address the outstanding safeguards implementation issues in individual States. Therefore, IAEA is likely to have to deliver soundly based safeguards conclusions in a resource constrained environment into the future. IAEA will continue to seek ways to improve its productivity by optimizing processes, making better use of modern technology and by enhancing cooperation with State and regional authorities in the implementation of safeguards. Continued success will require States' political, technical and financial support.